((SIN(.1))↑2)+((COS(.1))↑2)=j

+0.1000000E+01

PDP-8

A DEMONSTRATION PROGRAM: "CALCULATOR"

The PDP-8 equation evaluation demonstration is designed to show some of the floating point arithmetic and logic capabilities of the PDP-8. In the demonstration, the PDP-8 will be used as a scientific calculator with built-in logical decision capabilities. Nearly exact equivalents of FORTRAN expressions will be used. Operating instructions for the demonstration program are outlined below.

Although the calculations being performed are typical of PDP-8's arithmetic and logic capabilities, they do not represent the full computation power of PDP-8. In addition to PDP-8's capabilities as a powerful scientific calculating device, the PDP-8 is also a versatile tool for control applications and for data acquisition, information storage and retrieval and data processing.

In the demonstration program each arithmetic operation must be explicitly indicated by the keyboard characters representing the operation. These characters are called operators.

Extraneous spaces, tabs, carriage returns, and linefeeds are ignored by the program. The character semi-colon (;) is used to terminate input and to start compilation.

An arithmetic expression is normally evaluated from left to right. However, certain operations are always performed before others, regardless of their order in the expression. The operators and their priority of evaluation within the expression are listed below:

1. Expressions within parenthesis ( )
2. Exponentiation ↑
3. Multiplication, Division * , /
4. Unary minus −
5. Addition, subtraction + , −
6. Output =

For example:

4 + 6 = ; produces as output
+0.100000E + 02 or 10

4 + 2 * 3 = ; produces
+0.100000E + 02 or 10

(4 + 2) * 3 = ; produces
+0.180000E + 02 or 18

(4 + 2 =) * 3 = ; produces
+0.600000E + 01 or 6
+0.180000E + 02 or 18

+6 ↑ 2 = ; produces
+0.360000E + 02 or +36

9 ↑ .5 = ;
+0.300000E + 01 or 3

(4 + (3 * 2 =) =) *2 = ;
+0.600000E + 01 or 6
+0.100000E + 02 or 10
+0.200000E + 02 or 20

The following functional commands may be incorporated in expressions to be evaluated in the demonstration program. They represent only a portion of functions available in the PDP-8 repertoire.

ABS ( )	take absolute value of expression within parenthesis
SQT ( )	take square root of absolute value of expression within parenthesis
SIN ( )	take Sine of value of expression within parenthesis (considered to be in radians)
COS ( )	take cosine of value of expression within parenthesis (considered to be in radians)
ATN ( )	take arctangent of value of expression within parenthesis (answer in radians)
EXP ( )	take exponential (base e) of value of expression within parenthesis
LOG ( )	take natural log of absolute value of expression within parenthesis

These functions have the same priority in the demonstration program as multiplication and division operations.

For example:

ATN ((SIN (.1) =)/(COS (.1) =) =) = ; produces
+0.9983341E − 01 or SIN (.1)
+0.9950040E + 00 or COS. (.1)
+0.1003347E + 00 or SIN (.1)/COS (.1) = tan (.1)
+0.9999999 − 01 or .0999999 = $\tan^{-1}$ (tan (.1))

(SIN (.1)) ↑ 2 (COS (.1)) ↑ 2 = ; produces
+0.100000E + 01 or 1

Rubout causes the previous character typed to be erased. It may be used repeatedly. The erased character is then retyped.

For example:

((Rubout (Rubout (6 = ;
+0.600000E + 01

If the compiler detects a source language error, it will type SYNTAX? and start over again.

If rubout is used to "erase" more characters than were typed, STACK ERROR will be typed, and the program is restarted.

The demonstration is designed so that the engineer or scientist with little or no previous experience with a computer will be able to use the PDP-8.

In addition to the above commands, this demonstration program has the following capabilities:

OUTPUT FORMAT CONTROL:
FOR (X, Y)
where X is the number of digits, Y is the number of places to the right of the ".".

(over)

For example:

```
(2 + 3) FOR (3,2) = ) *2 FOR (4,1) = ;
+5.00
+10.0
```

There are also commands to generate and control loops. These may be used to produce a table of functions.

For example:

```
EXP (0[ + .5] FOR (3,1) = ) FOR (9,6) = R10;
+  .5
+  1.648721
+ 1.0
+  2.718282
+ 1.5
+  4.481688
+ 2.0
+  7.389059
+ 2.5
+ 12.182490
+ 3.0
+ 20.085520
+ 3.5
+ 33.115420
+ 4.0
+ 54.598120
+ 4.5
+ 90.017100
+ 5.0
+148.413000
```

The PDP-8 being used in the demonstration is in a minimum configuration and the basic floating point package used in the demonstration is part of the PDP-8 software library. The PDP-8, I/O teletype, and comprehensive software are all included at the basic price of $18,000.

For additional information please request additional PDP-8 literature or call your nearest Digital Equipment Corporation sales office.

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